

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application. Please amend the application as follows:

1. (currently amended): A quick-action clamping cylinder for general locking tasks in mechanical engineering, said quick-action clamping cylinder being used to anchor a feed nipple (2, 2') located on any desired part, characterized in that the built-in components of the quick-action clamping cylinder that are fundamental to its function are configured as an insert module (21; 25) which are fitted into the housing (4) of the quick-action clamping cylinder in a modular manner and has principally a lid (1), a housing (2), between these a space with a piston (3), which can be displaced under pressure oil and is spring-loaded against a spring assembly (8), and associated balls (5) which can be locked with a feed nipple (2, 2'), the insert module (21) consisting principally of a spring-holding plate (22; 26), a spring (8) and a ball support (6; 27), and of a connection holding the parts together, and the spring-holding plate (22; 26) forms an annular seat for one side of the spring (8), and in that the other end of the spring (8) bears on the underside of the ball support (6; 27) such that the spring (8) is firmly clamped in a defined manner between these two parts (22; 26, 6; 27) and is secured with considerable pretensioning by ~~[[the]]~~ a screw (7) or a thread (28).

2. (currently amended): The quick-action clamping cylinder as claimed in claim ~~[[2]]~~ 1, characterized in that the connection for the parts (22; 26, 8, 6; 27) is a screw connection.

3. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 4~~ claim 1, characterized in that the insert module (21, 25) also has an internal seal (71) which prevents air or dirt from getting into the spring chamber of the spring (8).

4. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 5~~ claim 1, characterized in that the insert module (21, 25) is also connected directly to an adapter (43) which is screwed with one part onto the thread end of the screw (7) and which, with its other, peg-like extension, in turn engages in the drill bush (40).

5. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 6~~ claim 4, characterized in that the adapter (43) is mounted without play in a centering recess (44) on the underside of the insert module (21, 25) in order thereby to ensure centering, likewise without play, of the quick-action clamping cylinder on an associated mounting surface.

6. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 7~~ claim 1, characterized in that the top face of the quick-action clamping cylinder can be covered by a cover plate (47), and the latter is held by a corresponding securing ring (14).

7. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 8~~ claim 1, characterized in that ~~[[the]]~~ a central recess (34) of the quick-action clamping cylinder can also be opened toward the bottom in order thereby either to ensure a downward flow of liquid, in arrow direction (51), or also to deliver corresponding air or coolant or other media from below, in arrow direction (52).

8. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 9~~ claim 1, characterized in that ~~[[the]]~~ a inner circumference of the recess (54) is used directly as a piston sealing surface and piston running surface for the piston (3), and in that the insert module (21, 25) can be fitted in this central, upwardly open recess (54).

9. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 10~~ claim 1, characterized in that the spring (8) to be secured is held directly under ~~[[the]]~~ a ball support (56), and the piston runs sealingly, on the one hand, on a radial outer face of the ball support (56) and, on the other hand, on a radial inner face of ~~[[the]]~~ a central recess (54).

10. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 11~~ claim 9, characterized in that a stop ring (55) is fitted in the interior of the recess (54) and serves as a stop surface for the piston (3).

11. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 12~~ claim 1, characterized in that a piston (3) is arranged displaceably in the interior of the housing (4), the piston (3) forming an axially upwardly extended annular shoulder (17) whose radial outer faces bear with associated O-rings on the associated inner wall of the lid (1) and are sealingly and displaceably guided there.

12. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 13~~ claim 1, characterized in that the lower part of the piston (3) is radially widened and bears sealingly on the inner circumference of the housing (4), so that a pressure chamber (16) for ~~[[the]]~~ oil is formed between the underside of the lid (1), the annular shoulder of the piston (3) and the housing (4).

13. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 14~~ claim 1, characterized in that a large number of balls (5) bear on the inner face of ~~[[the]]~~ an axial annular shoulder (17) of the piston (3), which balls (5), from this annular shoulder, are either moved radially inward to the feed nipple (2) or are moved away therefrom, for which purpose ball raceways are accordingly created on a ball support (6) and form depressions for the balls (5).

14. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 15~~ claim 13, characterized in that, in the unlocked state of the quick-action clamping cylinder, the balls (5) lie in the recessed ball supports and accordingly are at a distance from the underside of the lid (1), but when this radially outwardly directed shoulder of the feed nipple (2) has run past the ball (5), the latter then drops into the ball-shaped recess on the surface of the ball support (6).

15. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 16~~ claim 14, characterized in that the radial shoulder on the underside of the feed nipple (2) permits a movement of the ball in the locking direction in connection with the annular shoulder (17) of the piston (3).

16. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 17~~ claim 1, characterized in that the quick-action clamping cylinder holds the feed nipple (2, 2') in the housing (4) with self-locking, so that the balls (5) enter into positive locking engagement with the feed nipple (2, 2').

17. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 18~~ claim 1, characterized in that the quick-action clamping cylinder provides a block closure such that the locking of the feed nipple (2, 2') takes place under the force of the spring (8) which press the balls (5) in their engagement position on the feed nipple (2, 2'), and the unlocking of the quick-action clamping cylinder takes place under the effect of pressure oil which is introduced into the housing (4) into the space between the underside of the lid (1) and the top face of the piston (3).

18. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 19~~ claim 1, characterized in that the locking balls (5) are assigned on the one hand to raised surfaces of the ball support, for in the quick-action clamping cylinder in the locked state in a form-fit manner, and, on the other hand, are clamped on the underside of the lid (1), as a result of which they are no longer movable and bear in this locked position in a defined manner in the associated annular recess on the feed nipple (2, 2') so that the latter is absolutely locked and is secured free from play.

19. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 20~~ claim 1, characterized in that, in the locking movement of the piston (3), ~~[[the]]~~ a greater bevel (18) first bears on the balls (5) in the high-speed stroke and moves these radially inward in the direction of the feed nipple (2), and, as soon as the balls (5) are then bearing with a form fit on the associated bevel on the feed nipple (2), ~~[[the]]~~ a bevel (19) also bears on the circumference of the balls (5), and, with this bevel (19), the relatively large spring force of the spring (8) is transmitted to the balls (5), specifically in a ratio of about 6.5:1, which means the spring force of the spring (8) is translated approximately by 6.5 times to the balls (5), which bear with precisely correspondingly great locking force on a feed nipple (2).

20. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 21~~ claim 1, characterized in that, by forming a radially outward and approximately annular and narrow pressure chamber (16) for ~~[[the]]~~ pressure oil, the entire underside of the quick-action clamping cylinder is kept free from pressure oil.

21. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 22~~ claim 1, characterized in that, because of the complete freedom of the central interior of the quick-action clamping cylinder and of any pressure oil chambers, because these are offset radially outward, corresponding outlet openings can be routed from the interior, and from these outlet openings, for example, drilling water and a medium carrying chips and dirt and the like can flow off downward.

22. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 23~~ claim 1, characterized in that ~~[[the]]~~ a screw-on base (23; 38) forms one or more axially projecting pegs (39) which engage associated drill bushes (40) of a perforated grid plate and thus secure the quick-action clamping cylinder on this perforated grid plate.

23. (currently amended): The quick-action clamping cylinder as claimed in ~~one of claims 1 through 24~~ claim 1, characterized in that the quick-action clamping cylinder can ~~also~~ be installed embedded in a central recess in ~~[[the]]~~ a machine bench, and ~~[[the]]~~ pressure oil can ~~[[now]]~~ be directly guided in from the side radially in the machine bench to the quick-action clamping cylinder built into the central recess.